

WHAT IS CLAIMED IS:

1. A method of planarizing an interlayer dielectric layer, the method comprising:

forming a first interlayer dielectric layer over a first region in which a capacitor is formed and a second region adjacent to the first region, the first region being higher than the second region;

forming a second interlayer dielectric layer over the first interlayer dielectric layer, the second interlayer dielectric layer having an etching selectivity different from that of the first interlayer dielectric layer;

forming a third interlayer dielectric layer over the second interlayer dielectric layer, the third interlayer dielectric layer having an etching selectivity different from that of the second interlayer dielectric layer; and

chemical mechanical polishing the third and second interlayer dielectric layers in the first region using the third interlayer dielectric layer in the second region and the first interlayer dielectric layer in the first region as etching end points.

2. The method of claim 1, wherein the third interlayer dielectric layer has the same etching selectivity in the chemical mechanical polishing step as that of the first interlayer dielectric layer.

3. The method of claim 1, wherein the second interlayer dielectric layer has a lower etching selectivity in the chemical mechanical polishing step than that of the first and third interlayer dielectric layers.

5 4. The method of claim 1, wherein the third interlayer dielectric layer in the second region is higher than the first interlayer dielectric layer in the first region.

10 5. The method of claim 1, wherein the third and second interlayer dielectric layers are chemical mechanical polished once using a slurry having an etching selectivity between the second and third interlayer dielectric layers that is greater than 5:1.

15 6. The method of claim 5, wherein the first and third interlayer dielectric layers are made of a material selected from a group consisting of flow fill, SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN, anti reflection coating, and a combination of these materials, the second interlayer dielectric layer is made of a material selected from a group consisting of plasma enhanced oxide, undoped silicate glass, spin on glass, flowable oxide, 20 boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced

tetraethylorthosilicate, and a combination of these materials, and the slurry is a ceria slurry.

7. The method of claim 1, wherein the chemical mechanical polishing
5 of the third and second interlayer dielectric layers comprises:

removing the third interlayer dielectric layer in the first region using a first slurry that etches the third interlayer dielectric layer at a higher etch rate than that of the second interlayer dielectric layer; and

removing the second interlayer dielectric layer in the first region using a
10 second slurry that etches the second interlayer dielectric layer at a higher etch rate than that of the first and third interlayer dielectric layers.

8. The method of claim 7, wherein the second slurry has an etching
selectivity between the second and third interlayer dielectric layers that is greater
15 than 5:1.

9. The method of claim 7, wherein the first and third interlayer
dielectric layers are made of a material selected from a group consisting of flow
fill, SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN,
20 anti reflection coating, and a combination of these materials, the second
interlayer dielectric layer is made of a material selected from a group consisting

of plasma enhanced oxide, undoped silicate glass, spin on glass, flowable oxide, boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced tetraethylorthosilicate, and a combination of these materials, and the second slurry is a ceria slurry.

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10. The method of claim 7, wherein the first and third interlayer dielectric layers are made of a material selected from a group consisting of flow fill, SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN, anti reflection coating, and a combination of these materials, the second interlayer dielectric layer is made of a material selected from a group consisting of plasma enhanced oxide, undoped silicate glass, spin on glass, flowable oxide, boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced tetraethylorthosilicate, and a combination of these materials, and the first slurry is a silica slurry.

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11. The method of claim 1, wherein the chemical mechanical polishing of the third and second interlayer dielectric layers comprises:

removing the third and second interlayer dielectric layers in the first region using a first slurry that has the same etching selectivity between the second and third interlayer dielectric layers; and

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removing the second interlayer dielectric layer in the first region using a second slurry that etches the second interlayer dielectric layer at a higher etch rate than that of the first and third interlayer dielectric layers.

5 12. The method of claim 11, wherein the second slurry has an etching selectivity between the second and third interlayer dielectric layers that is greater than 5:1.

10 13. The method of claim 11, wherein the first and third interlayer dielectric layers are made of a material selected from a group consisting of flow fill, SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN, anti reflection coating, and a combination of these materials, the second interlayer dielectric layer is made of a material selected from a group consisting of plasma enhanced oxide, undoped silicate glass, spin on glass, flowable oxide, boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced
15 tetraethylorthosilicate, and a combination of these materials, and the second slurry is a ceria slurry.

20 14. The method of claim 1, wherein the first and third interlayer dielectric layers are made of a material selected from a group consisting of SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN, anti

reflection coating, and a combination of these materials, and the second interlayer dielectric layer is made of a material selected from a group consisting of plasma enhanced oxide, undoped silicate glass, spin on glass, flowable oxide, boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced tetraethylorthosilicate, and a combination of these materials.

15. The method of claim 14, wherein the first interlayer dielectric layer is formed by first applying a material selected from the group consisting of boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced tetraethylorthosilicate, high density plasma oxide, and a combination of these materials and then applying a material selected from the group consisting of flow fill, SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN, anti reflection coating, and a combination of these materials.

16. The method of claim 1, wherein the third interlayer dielectric layer is made of the same material as that of the first interlayer dielectric layer.

17. The method of claim 1, wherein the third and second interlayer dielectric layers are chemical mechanical polished using a slurry selected from a group consisting of a silica slurry, a ceria slurry, a mangania slurry, an alumina slurry, and a combination of these materials.

18. The method of claim 1, wherein the first and third interlayer dielectric layers are made of a material selected from a group consisting of plasma enhanced oxide, undoped silicate glass, spin on glass, flowable oxide, boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced tetraethylorthosilicate, and a combination of these materials, and the second interlayer dielectric layer is made of a material selected from a group consisting of flow fill, SiLK, SiOC, black diamond, CORAL, undoped silicon, SiN, SiON, BN, anti reflection coating, and a combination of these materials.

19. A method of planarizing an interlayer dielectric layer, the method comprising:

forming a first interlayer dielectric layer both over a first region in which a capacitor is formed and a second region adjacent to the first region, the first region being higher than the second region;

forming a second interlayer dielectric layer over the first interlayer dielectric layer, the second interlayer dielectric layer having an etching selectivity different from that of the first interlayer dielectric layer; and

chemical mechanical polishing the second interlayer dielectric layer in first region using a slurry that etches the second interlayer dielectric layer at a higher etch rate than that of the first interlayer dielectric layer and using the first interlayer dielectric layer in the first region as an etching end point.

20. The method of claim 19, wherein the first interlayer dielectric layer is made of a material selected from a group consisting of plasma enhanced oxide, undoped silicate glass, flowable oxide, boro-phosphorus silicate glass, phosphorus silicate glass, plasma enhanced tetraethylorthosilicate, and a combination of these materials, and the second interlayer dielectric layer is made of a material selected from a group consisting of flow fill, SiLK, SiOC, black diamond, CORAL, undoped polysilicon, SiN, SiON, BN, anti reflection coating, and a combination of these materials.

21. The method of claim 19, wherein the second interlayer dielectric layer in the second region is higher than the first interlayer dielectric layer in the first region.

22. A method of planarizing an interlayer dielectric layer, the method comprising:

forming a first interlayer dielectric layer over a first region and a second region adjacent to the first region, the first region being higher than the second region;

forming a second interlayer dielectric layer over the first interlayer dielectric layer, the second interlayer dielectric layer having an etching selectivity different from that of the first interlayer dielectric layer;

forming a third interlayer dielectric layer over the second interlayer dielectric layer, the third interlayer dielectric layer having an etching selectivity different from that of the second interlayer dielectric layer;

chemical mechanical polishing the third interlayer dielectric layer in the first region to expose the second interlayer dielectric layer; and

chemical mechanical polishing the second interlayer dielectric layer in the first region using the third interlayer dielectric layer in the second region and the first interlayer dielectric layer in the first region as etching end points.

23. The method of claim 22, wherein the chemical mechanical polishing of the third interlayer dielectric layer comprises:

removing the third interlayer dielectric layer in the first region using a slurry that etches the third interlayer dielectric layer at a higher etch rate than that of the second interlayer dielectric layer.

24. The method of claim 22, wherein the chemical mechanical polishing of the second interlayer dielectric comprises:

removing the second interlayer dielectric layer in the first region using a slurry that etches the second interlayer dielectric layer at a higher etch rate than that of the first and third interlayer dielectric layers.

25. The method of claim 22, wherein the chemical mechanical polishing of the third and second interlayer dielectric layers comprises:

removing the third and second interlayer dielectric layers in the first region using a first slurry that has the same etching selectivity between the second and
5 third interlayer dielectric layers; and

removing the second interlayer dielectric layer in the first region using a second slurry that etches the second interlayer dielectric layer at a higher etch rate than that of the first and third interlayer dielectric layers.